other documents on wood, leather, and clay, as well as on paper, thus recovered, some are official secular documents throwing light upon the every-day life and history of that early period. The majority are religious, mostly Buddhist, but also Taoist, Manichæan, and Nestorian Christian; and the writing is in the ancient Indian Brahmi and Kharoshthi characters, in a Sanskritic language, also in Chinese, Tibetan, Sogdian, archaic Turkish, and several are in "unknown" script. The detailed reports on this vast mass of material are under preparation, with the collaboration of experts, and will take several years to complete. Of the geographical results, which gained for Dr. Stein the Founders' gold medal of the Royal Geographical Society, we have an instalment in several excellent maps in the volumes. Scientific observations were also made upon the general desiccation of the area, and the advance of the desert, with the resultant changes in the sites of the settlements under the altered economic environments. A large series of anthropometric measurements was secured, and is to be eventually published.

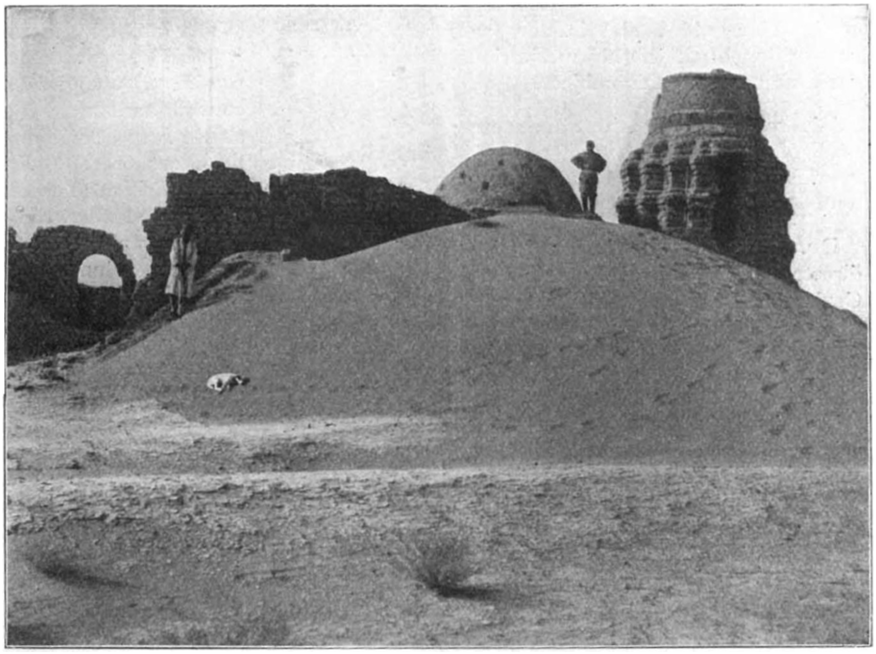

FIG. 2.—Ruins of small Buddhist stupa and shrine at Kichik-Hassar, Turfan. From "Ruins of Desert Cathay."

The personal narrative now chronicled is of fascinating interest. It is told with vivid clearness and in charming style, and through it all we feel the haunting presence of the great deserts. The splendid photographs, taken by Dr. Stein himself, which adorn the book are superb, and many of them reproduce the paintings and frescoes in colours by photomechanical processes with great technical accuracy and beauty.

The methods of research revealed by these pages are most instructive. The author combines in his personality all those qualities that are essential for the highest achievement in archæological research. A scholar and archæologist of repute with the practical experience, resourcefulness, and physical vigour of the trained explorer, he is able to penetrate to the most remote regions, and, though isolated, yet instinctively to miss no clue or opportunity that may present itself. His sympathetic insight and attitude towards the shy and usually suspicious nomads amongst whom he moved, and on whose assistance he largely depended in his research, won him at every turn the entire confidence of these people, who even became inspired with some of his own abounding enthusiasm. His unfailing tact smoothed over many difficulties; his foresight and business talent in leaving nothing to chance contributed much to the ultimate success of his plans. With inexhaustible energy and devotion in the pursuit of science he bravely and cheerfully faced and endured great privations and actual frostbite.

The magnificent results he has achieved are worthy of such great self-sacrifice. But what is the reward desired by this intrepid scholar, with such unique qualifications for archæological Oriental research? In his concluding sentence he says: "When may I hope that the gate will open for work in those fields to which cherished plans have been calling me ever since my youth, and which still remain unexplored?" It is to be hoped that this appeal in the interests of science may soon be realised. May the Government of India at no distant date enable our author to proceed to Badakhshan and the Upper Oxus region (to the north-west of India) to recover the Western connecting links between the ancient culture of the Orient and the Near East and West, which still await the masterly discovery by such a peerless explorer as Dr. Stein has proved himself to be.

L. A. WADDELL.

NOTES.

A CONSIDERABLE area of "submerged forest" has recently been laid bare at Freshwater West, Pembrokeshire, owing to extensive shifting of sand and shingle by a gale in conjunction with an unusually high spring tide, and has been examined by Lieut.-Colonel F. Lambton. Stumps of trees rooted in place are frequent, embedded in a foot or so of peat covering an old land-surface. No implements appear to have been found, but there is little doubt that the deposit is of the same age, viz. Neolithic, as the similar formation found elsewhere along our coasts.

The vegetable matter has darkened, but shows no other resemblance to coal, the statements in the daily Press on this, as on other points, being erroneous. Much is soft and pulpy, but some is still hard and flexible. In some overlying beach-sand of the same general age, part of the skull of a whale, probably the common rorqual, has been found, together with a great quantity of drift-wood in the same condition as the wood *in situ*. This beach-sand is now partly cemented with pyrites.

THE council of the Iron and Steel Institute has decided to award the Andrew Carnegie gold medal of the institute to Dr. Paul Goerens, of Aachen. Dr. Goerens has made many contributions to scientific metallurgy, and in 1910 he was awarded one of the Carnegie scholarships of the Iron and Steel Institute, to enable him to pursue his investigations on the influence of cold-working on the properties of iron and steel. The gold medal is now awarded to him in recognition of the highly meritorious character of his research work on this subject.

WE regret to see the announcement of the death of Prof. A. Pacinotti, professor of technical physics at the University of Pisa, at seventy-one years of age.

DR. J. C. WILLIS has retired from the post of director of the Royal Botanic Gardens, Peradeniya, Ceylon, and has accepted the appointment of director of the Botanic Gardens (Jardim Botanico) at Rio de Janeiro. He will sail by the *Orcoma* from Liverpool on April 4.

THE death is announced, at the age of seventy-six years, of Prof. Auguste Töpler, who from 1876 to 1900 was head of the physics department of the Technical High School of Dresden, and was the inventor of the well-known mercury pump bearing his name. We also notice the announcement of the death, at sixty-nine years of age, of Prof. Wilhelm Münch, professor of pedagogics at the University of Berlin.

THE death is reported, in his fifty-fifth year, of Dr. John Bernhardt Smith, a well-known American writer on entomology. He was educated for the Bar, and practised as a lawyer for several years. His first scientific appointment was as assistant curator of insects in the United States National Museum in 1886. In 1889 he became professor of entomology at Rutgers College, and in 1894 State entomologist of New Jersey. In the latter capacity he did much to get rid of the mosquito pest in that State.

DR. WILLIAM TRELEASE has resigned his post as the director of the Missouri Botanical Garden, familiarly known in the United States as Shaw's Garden. Dr. Trelease was appointed director of the garden by the late Mr. Henry Shaw, its founder, on the recommendation of Prof. Asa Gray, and has held the position since 1889. The garden is exceeded in size only by Kew Gardens. The director's report for 1909 shows that at the end of that year the garden contained 11,764 species, representing 1777 genera belonging to 197 families. The number of visitors during the same year was 120,748, a number exceeded only in 1907, when the total reached 135,497.

THE tenth annual session of the South African Association for the Advancement of Science will be held in Port Elizabeth from Monday, July 1, to Saturday, July 6, inclusive, under the presidency of Dr. A. Theiler, C.M.G. The sections and their presidents are as follows:—A, astronomy, mathematics, physics, meteorology, geodesy, surveying, engineering, architecture, and irrigation, Mr. H. J. Holder; B, chemistry, geology, metallurgy, mineralogy, and geography, Prof. B. de St. J. van der Riet; C, bacteriology, botany, zoology, agriculture, forestry, physiology, hygiene, and sanitary science, Mr. F. W. FitzSimons; D, anthropology, ethnology, education, history, mental science, philology, political economy, sociology, and statistics, Mr. W. A. Way.

THE annual general meeting of the Ray Society was held on March 14; Dr. B. Daydon Jackson, vice-president, occupied the chair. The report of the council announced a small increase in the membership of the society; the issue of two volumes for the year 1911, "British Desmidiaceæ," vol. iv., and "British Tunicata," vol. iii., completing that work; and that the volumes for 1912 would be a "Bibliography of the Tunicata," by the secretary, and the first volume of "British Parasitic Copepoda," by Dr. Thomas Scott and Mr. Andrew Scott, treating of the copepoda parasitic on fishes, which division of the subject would be completed by the issue for 1913 of an atlas of seventy plates, mostly coloured. The balance-sheet showed the finances of the society to be in a satisfactory condition. The Right Hon. Lord Avebury was re-elected president, Dr. F. DuCane Godman treasurer, and Mr. John Hopkinson secretary.

THE report of the Departmental Committee on Forestry in Scotland has been issued as a Blue-book (Cd. 6085). It will be remembered that the terms of reference to the committee were, among other matters, to report as to the selection of a suitable location for a demonstration forest area in Scotland, the uses to which such an area could be put, and the probable cost. The committee thinks the area should contain at least 4000 acres, including, if possible, 2000 acres already under wood. The plantable land might with advantage amount to 10,000 acres, but, says the report, such an extent, combined with the necessary growing woods, may be difficult to secure. Recommendations are made as to the staff required and to equipment, and so on. No estimate is given of the probable capital expenditure, though the estimate of capital outlay for establishment is placed at 15,500*l.*, and the estimate of initial annual expenditure at 2400*l.* Three steps are recommended following on the establishment of a demonstration area for the promotion of sylviculture in Scotland: a flying survey to ascertain the best forest sites and their approximate extent; the appointment of an advising forest officer, with at least one assistant; and the establishment of a limited number of State trial-forests.

In a paper recently contributed to the Proceedings of the British Academy, Mr. D. G. Hogarth discusses certain problems of Hittite history in relation to the excavations now in progress under the control of the British Museum at the mound of Jerablus, the Carchemish of the Old Testament. These excavations are still only in a preliminary stage, but sufficient evidence has already been collected to prove that there were Hittites, or at least Hittite influences, in Syria before its conquest by the king of the Hatti of Boghaz Keui; that the Cappadocian occupation established by the latter did not eliminate the earlier stock at Carchemish, and was not very long-lasting; and that it was succeeded by a period of independence of Cappadocia and dependence upon Assyria, prior to complete conquest by the latter power. The exact relation of this Syrian culture to that of Mesopotamia, Assyria, and the Ægean is a problem on which these important excavations may be expected, at an early date, to throw welcome light.

In an article on megalithic remains in Gloucestershire, contributed to the March issue of *Man* by Mr. A. L. Lewis, the question is raised whether the chambered barrow at Uley was used for the cult of the dead so late as Roman times. This theory was advocated by Mr. W. C. Borlase ("The Dolmens of Ireland," p. 974), who laid stress on the discovery of a Roman lachrymatory in one of the side chambers. Mr. Lewis sees no reason to object to this view, but he points out that Thurnam ("Archæologia," vol. xlii.) speaks only of "a small vessel described as resembling a Roman lachrymatory." It is possible that this may have dropped into the chamber of the barrow from a secondary interment on the summit, the date of which is established by the discovery with the corpse of brass coins of the three sons of Constantine the Great.

Mr. R. Ridgway is to be congratulated on the issue of the fifth volume of his valuable descriptive catalogue of the birds of North and Middle America (published as Bulletin No. 50 of the U.S. National Museum). This volume brings the subject down to the end of the trogons. The number of species and subspecies (apart from certain extra-limital forms) recorded in the five volumes already published is 2038, leaving from about 1150 to 1200 to come.

Bulletin No. 101 of the Entomological Section of the U.S. Department of Agriculture is devoted to an account, by Mr. A. F. Burgess, of the elaborate measures taken to introduce and acclimatise in New England the European ground-beetle, *Calosoma sycophanta*, for the purpose of keeping in check the destructive gipsy and brown-tail moths (introduced inadvertently from Europe), on the caterpillars of which these beetles prey. After much trouble, the acclimatisation has been successfully accomplished.

In the section on marine biology in the Ceylon Administration Reports for 1910–11 and in the January number of *Spolia Zeylanica*, Dr. J. Pearson records the work that has been recently accomplished in connection with the pearl-banks, the windowpane-oyster (Placuna) fishery, and the fresh-water fisheries of the island. For some years past the Placuna beds in Lake Tamblegam have been commercially unprofitable, and a survey of the lake has been accordingly undertaken. This shows that in some parts there are beds of living oysters, while in others only dead shells are to be found, and it is considered that much may be done by transplantation. To make this effective, annual surveys are deemed necessary. Steps are also to be taken for introducing a fresh supply of that valuable food-fish the gurami, as only three survivors of those introduced by Dr. Willey were discovered.

Students of zoology should welcome the appearance of the third and fourth volumes of the delightful little monographs of indigenous animals prepared by Profs. Ziegler and Woltereck (Leipzig: Verlag von Dr. Werner Klinkhardt). The third volume, by Dr. Otto Steche, deals with Hydra and the Hydroids, and is an altogether admirable account of the freshwater polypes and their marine relatives, including a most useful introduction to experimental biology. The fourth volume is devoted to the edible snail (*Helix pomatia*), which is treated in a very comprehensive and thorough manner. The beautiful coloured frontispieces form one of the most attractive features of these volumes, which are published at four marks each.

Assuming the observations to be trustworthy, a most remarkable case of the efforts of an organism to free itself from a parasite has been recently recorded. In 1910 Mr. O. Schröder (*Zeits. wiss. Zool.*, vol. xlvi., p. 525) described and figured, under the name of *Buddenbrockia plumatellae*, a parasite infesting the body-cavity of polyzoans of the genus Plumatella. At the time the parasite was provisionally regarded as a mesozoan. This determination was, however, on the face of it improbable, seeing that the Mesozoa are a marine group, and the author (*Verk. nat.-med. Heidelberg*, N.F., vol. xi., p. 230, 1912) has recently come to the conclusion that the parasite is in all probability a very degenerate nematode. Be this as it may, the interesting point is that after the parasite has become established in the body-cavity of its host some of the spermatozoa of the latter penetrate the eggs of the former, which thereupon swell up and undergo a kind of degenerate development, until they ultimately perish, the polyzoan thus making use of its male generative products as torpedoes to destroy an enemy. Such a mode of repelling a hostile attack appears quite unknown in any other group of organisms.

The Agricultural Statistics of India for the years 1905–6 to 1909–10 have recently been published at Calcutta by the Department of Revenue and Agriculture of the Government of India. The first volume, a large Blue-book of more than 400 pages, deals with British India; the second, a much smaller one, with the native States. The first section deals with the classification of areas in each district into forest, land not available for cultivation, land culturable but at present waste, and areas cropped; irrigation statistics are also given. In a later section the areas under the various crops are set out. Other sections deal with live stock and implements, incidence of revenue assessment, and transfers of land.

A REMARKABLE instance, caused by a parasitic fungus, of the transformation of the flower into a number of leaf-like organs is described by Mr. S. Kusano in the Journal of the Tokyo Agricultural College (vol. ii., No. 6). The fungus, *Caeoma Makinoi*, infects the young buds of *Prunus Mume*, and causes great malformation of the organs of the flower. In some cases only part of the flower is affected, in others all organs are subjected to more or less complete phyllody. Occasionally flowers of enormous size are produced, which possess not only green leaves brilliantly spotted with the yellow pustules of the fungus, but also leafy shoots. The author describes the phyllody of the different floral organs with great care, and discusses the relation between the development of the fungus and the malformation of the flower. His paper, which concludes with some interesting etiological considerations, forms a valuable contribution to the literature on chloranthy.

IN the *Atti dei Lincei*, xxi., 4, Dr. Diana Bruschi contributes some interesting studies on three fungi parasitic on fruits, namely, *Fusarium lycopeisici* on the tomato, *Movilia cinerea* on the plum, and *Fusarium niveum* on the pumpkin. It is found that the toxic action of the fungi is not proportional to the acidity of the extract produced by them, and disappears to a large extent with cooking. The enzymes secreted do not attack the cellulose, but rather the proteins, of the fruits.

THE list of geological literature added to the library of the Geological Society of London in 1910 was issued at the close of 1911, price 2*s*. As we have previously pointed out, this annual work is practically an index to the geological publications of the world.

THE study of eoliths has assumed such importance that it may not be too late to direct attention to a discussion of the alleged examples of Oligocene age found by A. Rutot on the plateau of Hautes-Fagnes, in Belgium. R. Bonnet and G. Steinmann conclude that they were formed by wave-action in a rapidly advancing sea (*Sitzungsber. vom naturhistor. Verein der preuss. Rheinlande u. Westfalens*, December 6, 1909, pub. 1910). A useful bibliography of some sixty works in French and German on eoliths is appended.

IN *Scientia*, vol. xi. (1912), p. 36, Prof. J. W. Gregory discusses "The Structural and Petrographic Classification of Coast-types" in a manner that will appeal both to geographers and to geologists. He succeeds in showing how difficult it is to maintain Suess's original definitions of the Atlantic and Pacific types of coast in the broad regions from which their names were derived, and he criticises the attempt to connect types of igneous rock with types of tectonic structure.

THE Weather Bureau of the Commonwealth of Australia has issued in the form of a picture postcard an average rainfall map of the Commonwealth, together with a table showing the comparison between the total area of the United Kingdom and the different rainfall areas shown by grades on the rainfall map of Australia. The map was prepared under the direction of Mr. H. A. Hunt, Commonwealth meteorologist.

"THE Value of Non-instrumental Weather Observations" is the title of an interesting article by Prof. R. DeC. Ward in *The Popular Science Monthly* of February. Like some meteorologists in this country, he considers that such observations add greatly to the interest of everyday life, and develop in a surprising way powers of observation which one is unconscious of possessing. In relating his own experiences during a recent period of convalescence, he suggests the study of weather prognostics (comparatively few of which are found to be really good). In emphasising the value of non-instrumental observations, he refers at considerable length to the Journals of the Lewis and Clark expedition to the sources of the Missouri and across the Rocky Mountains in 1804-6, the leader of which was instructed by President Jefferson to report upon the climate according to a scheme drawn up by himself. No more striking illustration of the analogy between the winds of the ocean and those of the plains has been given than Captain Lewis's description of the occasion when one of his boats, which was being transferred on wheels, was blown along, the boat's sails being set. "Both [winds] sweep over a surface of little friction. Both attain high velocities in consequence."

AN illustration of the growing importance of mathematics in the study of social and economic problems is afforded by Dr. L. Amoroso's note in the *Atti dei Lincei*, xxi., 4, entitled "Contributions to the Mathematical Theory of Economic Dynamics." In this system an individual is represented by a point capable of moving in a variety of *n* dimensions, which may represent different forms of wealth, and these are subject to certain equations of condition. From the fundamental premises the author deduces "equations of motion" corresponding to those of analytical dynamics. The first investigations on this branch of study are attributed to Cournot, Jevons, Malras, Edgeworth, Fisher, and, latterly, Pareto.

IN a pamphlet called "Studies in Statistical Representation," reprinted from the Journal of the Royal Society of New South Wales, Mr. G. H. Knibbs discusses the application of Fourier's series to the study of fluctuating statistics. The paper deals mainly with the methods of obtaining the coefficients in such expansions, and of correcting for such irregularities as inequality in the lengths of months or years, variations in the time of Easter, and so forth. The author, as illustrating the method, claims to deduce a relation between the temperature and the number of suicides in Australia, but remarks: "The discussion as to whether this relation can be rationalised is really an extra-mathematical one, and is outside the scope of the present paper." A contribution to the higher mathematics of statistics is contained in Prof. C. V. L. Charlier's recent article in the *Arkiv* *för Matematik* on the theorems of Poisson and Lexis.

ACCORDING to an article reprinted from the Proceedings of the Academy of Science of Amsterdam, Prof. Zeeman, in the course of some experiments on the double refraction produced in liquid air by an electric field, has found that liquid air will stand an electric field of 90,000 volts per centimetre. In his double refraction measurements a difference of potential of 17,000 volts was maintained between the plates of a condenser 4·5 centimetres long, 1·0 centimetre wide, and 0·3 centimetre apart immersed in liquid air, and a beam of plane polarised homogeneous light traversed the liquid air between the plates. The phase difference introduced by the double refraction due to the electric field was estimated at 1/300 wave-length, so that the Kerr constant for liquid air is about 1/20 of that of carbon bisulphide.

THE therapeutic action of certain mineral springs has been recently attributed, at least in part, to the presence of the radium emanation in the water. Experimental evidence in support of this view is given by P. Mesernitsky in the current number of the *Comptes rendus* of the Paris Academy of Sciences. It was found that the radium emanation decomposes sodium urate, some ammonium salts being formed. The exact nature of the decomposition (which was shown to be due to the action of the α rays, the penetrating rays being without effect) has not been completely made out, but there is a marked increase of solubility of the urate. It is suggested by the author that this action of the α rays upon sodium monourate may furnish an explanation of the therapeutic effects of the emanation in gouty cases.

A PAPER by Mr. Andrea Naccari in vol. xlvii. of the *Atti* of the Academy of Sciences of Turin (December, 1911) takes as its starting point an old memoir by Samuel Hunter Christie in the Phil. Trans. for 1826, entitled "On Magnetic Influence in the Solar Rays." Christie found the amplitude of oscillation of a magnet to decrease more rapidly than usual when sunlight fell on the magnet. The phenomenon had since been studied by Baumgartner, who found that it was not confined to magnets, and concluded that the real cause was air currents set up by the heating. Naccari confirms the view that magnetism has nothing to do with the phenomenon, but he differs from Baumgartner as to the cause. He ascribes it to the effect of radiation on the air which is carried by the oscillating body and that immediately surrounding it. Under certain conditions, the effect of thermal radiation on the damping seems very large, and further study of the phenomenon from the point of view of the kinetic theory of gases might not unlikely prove profitable.

IN a paper read at the Concrete Institute on March 14, Mr. Reginald Ryves treated the question of high dams of great length, and proposed a form of thrust buttress dam of arches, in which the whole of the water load is taken by masonry in direct compression, and neither the weight of the buttress nor the weight of the arch is taken into account as regards stability, except for resistance to sliding bodily when the ground is comparatively soft. Under normal conditions, the best slope for the water face is 45°. The dam consists of inclined arches of increasing thickness as the depth increases, and sloping at 45°. The abutments rest against the up-stream faces of the buttresses, which are built of layers all inclined at 45°. Every part of such a dam is subject to the same stress, except that the top layer of the buttress and the upper part of the arch ring may have the minimum in each case for the materials used. The author claims that this type is suitable for heights up to 200 ft. with a stress of 10 tons per square foot, and up to 300 ft. for 16 tons per square foot.

MR. EDWARD STANFORD has published an excellent, well-coloured geological map of central Europe which will prove of great service to students of geology, and less directly to teachers of geography. The map is 16¾ in. by 10½ in., and costs 5*s*.

M. J. DANNE asks us to say that his laboratory at Gif for experiments on radio-active substances is about 26 kilometres from Paris, and not 206 kilometres, as stated in last week's NATURE (p. 69).

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES FOR APRIL:

April 1.	0h. 0m.	Neptune stationary.
1.	1h. 0m.	Jupiter stationary.
1.	10h. 14m.	Moon eclipsed. Visible at Greenwich.
6.	8h. 32m.	Jupiter in conjunction with the Moon. (Jupiter 5° 8′ N.).
10.	4h. 54m.	Uranus in conjunction with the Moon. (Uranus 4° 46′ N.).
10.	19h. 0m.	Neptune at quadrature to the Sun.
15.	0h. 0m.	Mercury in inferior conjunction with the Sun.
15.	5h. 17m.	Venus in conjunction with the Moon. (Venus 0° 5′ N.).
16.	22h. 51m.	Sun eclipsed, partially visible at Greenwich, ends at 1.31 p.m. on April 17.
18.	18h. 31m.	Saturn in conjunction with the Moon. (Saturn 4° 47′ S.).
20–22.		Lyrid meteors at maximum.
22.	3h. 22m.	Mars in conjunction with the Moon. (Mars 3° 25′ S.).
22.	21h. 53m.	Neptune in conjunction with the Moon. (Neptune 5° 53′ S.).
23.	10h. 0m.	Uranus at quadrature to the Sun.
27.	11h. 53m.	Mercury in conjunction with Venus. (Mercury 0° 10′ N.).

THE ECLIPSE OF APRIL 17.—In the *Revue générale des Sciences,* the Abbé Moreux publishes an interesting summary concerning the chances of a total eclipse of the sun being observed on April 17 next. He points out that M. Landerer's very slight modifications of the data produced considerable changes in the figures showing the size and path of the shadow cone, but even then the maximum breadth of the latter was only 200 metres (about one-eighth mile).

Adopting the new figures given by Dr. Crommelin, the Abbé Moreux finds that totality will last 1·6s. just before reaching the Portuguese coast, 1·5s. between Penafiel, about twenty miles east from Oporto, and Cavez, and about 1s. as the shadow leaves the northern shore of the Peninsula. He calculates that at St. Germain and Namur the height of the apex of